Ontologies

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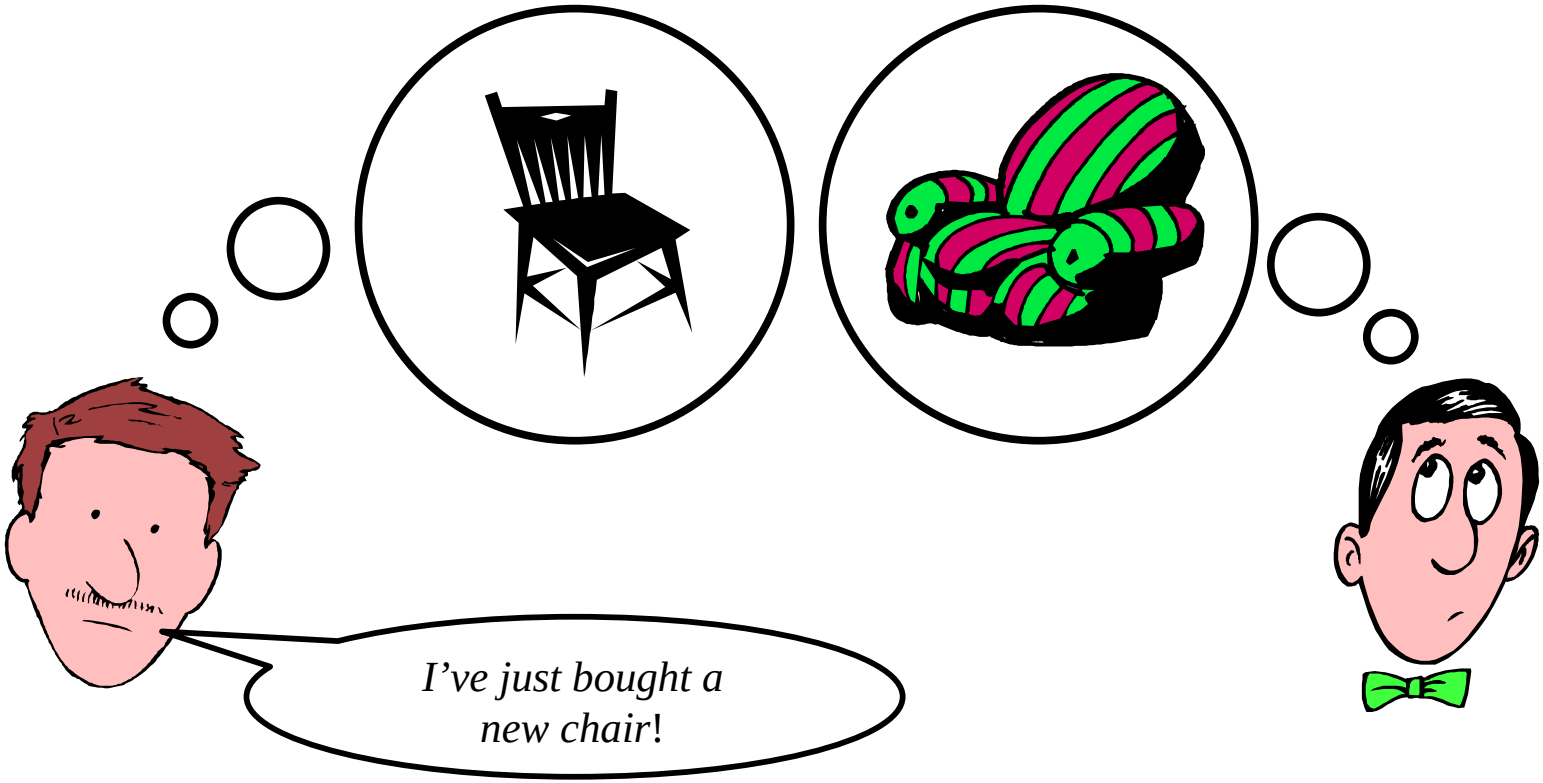
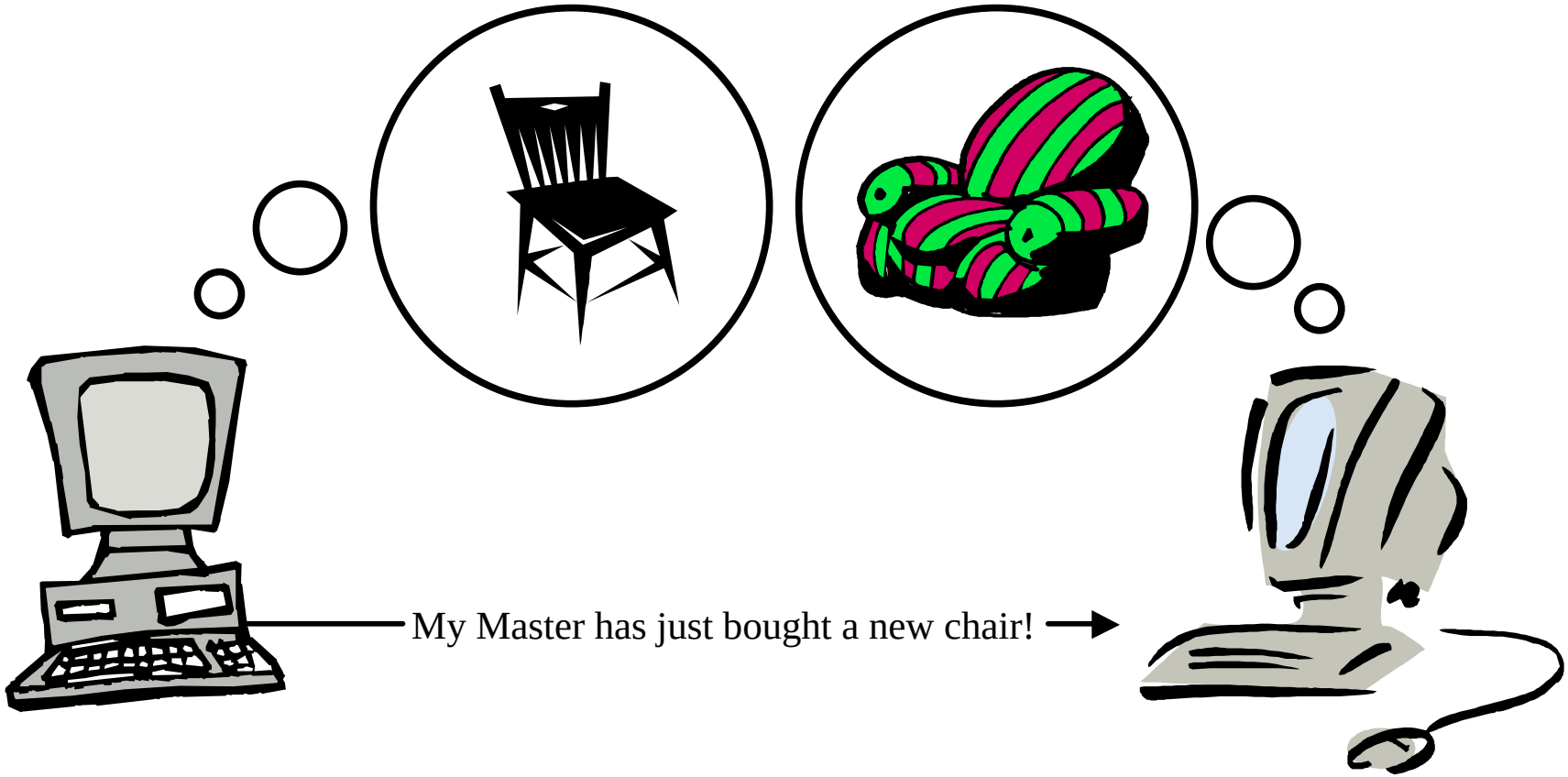
Presentation structure

- What problems ontologies try to solve?
- Defining ontologies
- Components of ontologies
- Different perspectives to ontologies
- Semantic web and ontologies



Problems communicating ideas?

Sharing the same vocabularity?

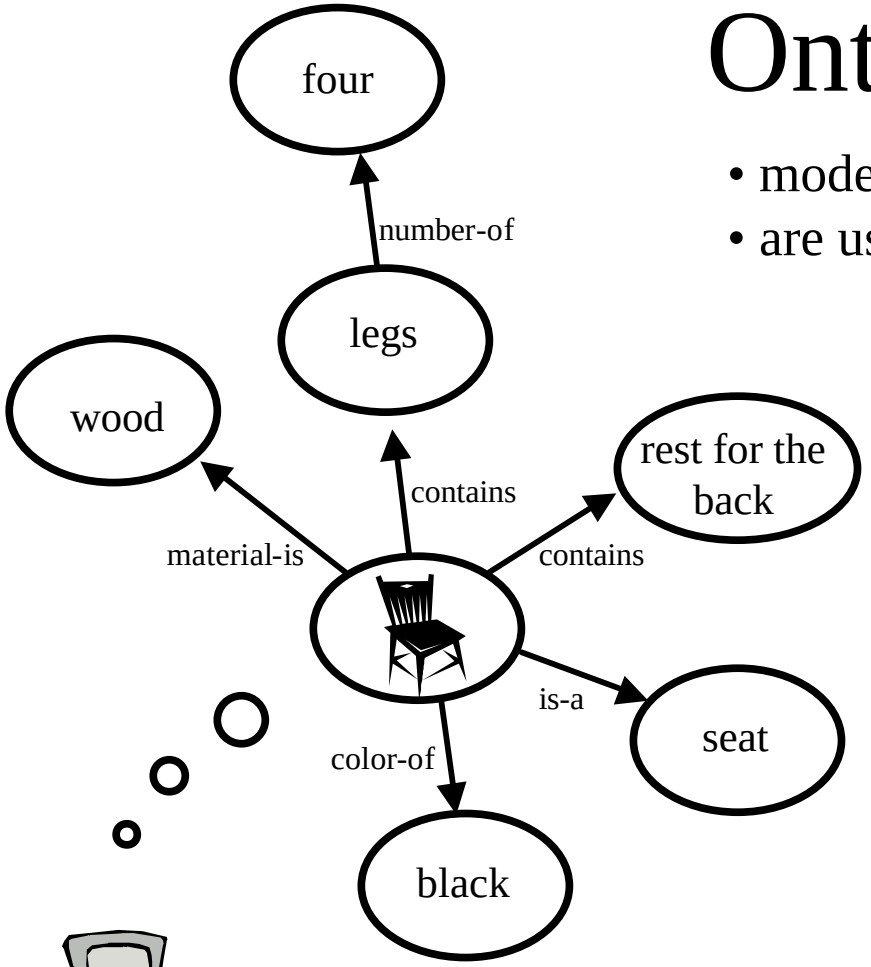


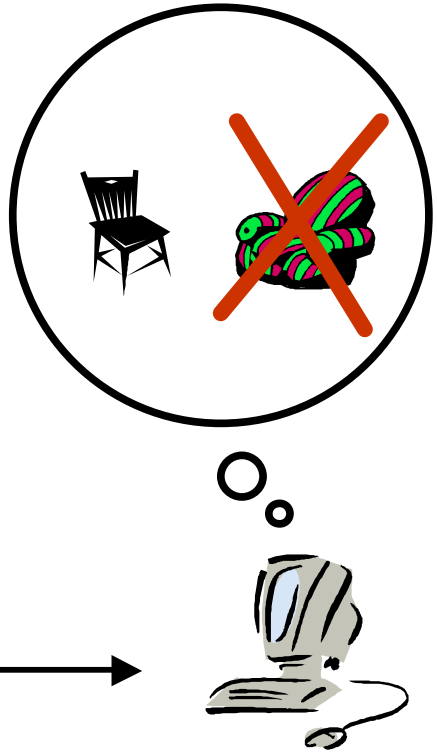
Problems communicating ideas?

Sharing the same vocabularity?

Ontologies

- model reality and
- are useful when sharing information





My Master has just bought a new chair!
Please ***commit*** to my ontology!

Defining ontology

An ontology is ***an explicit specification*** of a ***conceptualization*** (T. R. Gruber)

- An explicit specification
  - means that it is written using logic or other ***formal language***.
- Conceptualization
  - is a semantic ***structure which encodes the rules*** constraining the structure ***of reality***.

Components of ontologies

- Vocabularity of terms
  - Objects, concepts, words; Employee, Company
- Precise specification of what those terms mean
  - Relationships between objects; Employee of the Company
  - Attributes and properties; SSN of the Employee
  - Constraints; Each Emplyee can have only a single SSN

Different perspectives to ontologies

- The Philosophical perspective
- The Linguistics perspective
- The Knowledge Representation perspective
- Pragmatic perspective

The Philosophical perspective

- The Ontology – The science of being as such
- The Ontology tries to answer questions:
  - What is being?
  - What are the features common to all beings?
- Long history, Aristotle (*Metaphysics*)
- Different than the ontology in computer science!

The Linguistic perspective

- Terminological ontologies
  - Concepts are *words*
  - Large amount of concepts (*>100 000*)
  - Only few relation types (*is-a*)
  - Concepts apply small number of relations (*sparse*)
  - Concepts and relations rarely formally defined
- Ontology can be seen as a ***thesaurus*** or a ***taxonomy***
- Usage in language processing

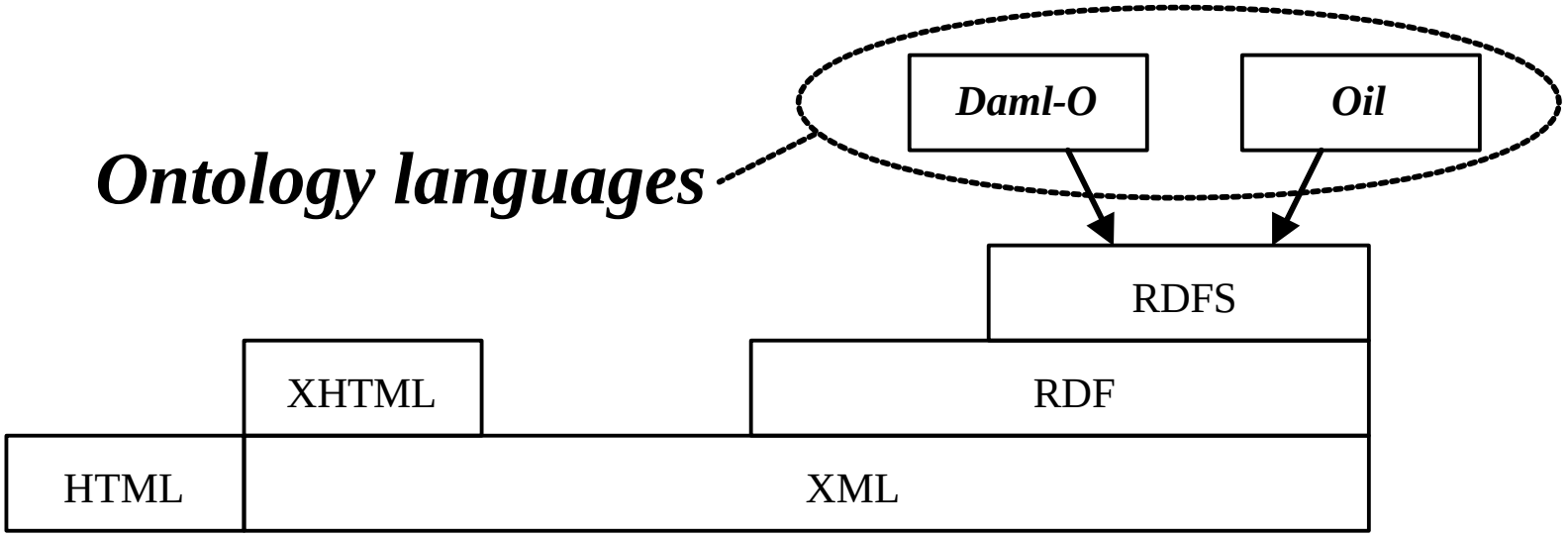
The Knowledge Representation perspective

- Conceptual ontologies
  - Concept vocabularity (*not only dictionary words*)
  - Small number of concepts (*<10 000*)
  - Rich set of relation types
  - Concepts apply many different relations (*dense*)
  - Concepts and relations formally defined (*logic*)
- Ontology can be seen as a ***knowledge base***
- Usage in
  - Modelling reality (Qualitative modelling)
  - Language engineering
  - Information modelling, integration, retrieval and extraction
  - ***Sharing information***

Pragmatic perspective

- What are ontologies for?
  - I want to understand it → ***Modelling reality!***
  - I want to understand you → ***Sharing information!***
  - I want my questions answered → ***Query processing!***
  - I want to think it again → ***Re-using knowledge!***

Semantic web and ontologies



- Usage
  - Access via Internet → ***Sharing information***
  - DTD & Schema type document validation → ***Semantic validation***
  - Information stored in ontology → ***Query prosessing***

Wrap-up

- Ontologies
  - Model reality
  - Are useful when sharing information
- Ontology components are
  - Vocabularity of terms
  - Precise specification of what those terms mean
- There exists a multiple different perspectives to ontologies
  - Philosophical perspective
  - Linguistics perspective
  - Knowledge representation
- Semantic web
  - DAML-O and OIL are ontology languages built on RDFS.

For more information see

http://www.formalontology.it
http://www.ontology.org
http://www.kr.org/top/
http://www-ksl.stanford.edu
http://www.ladseb.pd.cnr.it
http://www.w3.org/2001/sw/
http://www.xml.com/pub/rg/Ontology_Tools
http://www.cs.utexas.edu/users/mfkb/related.html

Keywords for search machines

Ontology, ontologies
Knowledge representation